13 Ver Ploeg, A.J., 1992a, Geologic map of the southern portion of The Horn Quadrangle, Johnson County,

Wyoming: Wyoming State Geological Survey files (unpublished), scale 1:24,000.

20 Ver Ploeg, A.J., and Greer, P.L., 1992, Preliminary geologic map of the Packsaddle Canyon

Quadrangle, Johnson County, Wyoming: Wyoming State Geological Survey Open File Report

Denson, N.M., Pierson, C.T., and Grundy, W.D., 1995, Geologic map showing thickness of sedimentary

Miscellaneous Investigations Series Map I-2433-B, scale 1:200,000.

rocks from the ground surface to the top of the upper Cretaceous Pierre shale in the south half of

the Powder River Basin, northeastern Wyoming and adjacent areas: U.S. Geological Survey

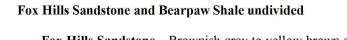
Kohout, F.A., 1957, Geology and ground-water resources of the Kaycee irrigation project, Johnson County,

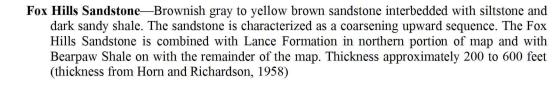
Wyoming: U.S. Geological Survey Water-Supply Paper 1360-E, p. 321-374, pl. 22, scale

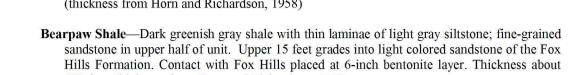
# **MAP SERIES 63** Kaycee 1:100,000 - scale Geologic Map

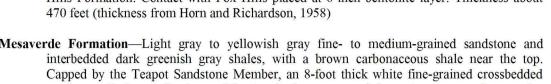


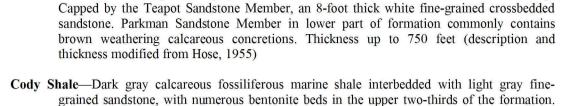
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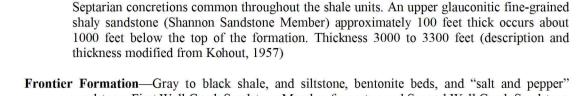




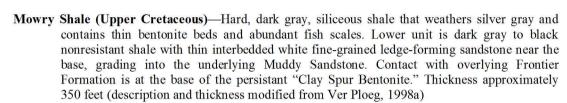








# Kmt Mowry Shale, Muddy Sandstone, and Thermopolis Shale undivided



#### Muddy Sandstone (Lower Cretaceous)—Tan to gray fine- to medium-grained friable to well lithified sandstone that is 5 to 30 feet thick. Easily identified by its drab color and grains of black minerals (description and thickness modified from Ver Ploeg, 1998a)

#### Thermopolis Shale (Lower Cretaceous)—Dark gray to black soft fissile shale with some interbedded bentonite layers. Ironstone concretions appear in the lower portion of the formation. Thickness 160 to 200 feet (description and thickness modified from Ver Ploeg, 1998a)

# KJm Cloverly and Morrison formations undivided

Ver Ploeg, 1998a)

#### Cloverly Formation (Lower Cretaceous)—Basal tan to white coarse-grained sandstone and chert pebble conglomerate, locally crossbedded and overlain by variegated buff and purple claystones interbedded with thin black shale beds, and an upper gray to buff to brown, fineto coarse-grained resistant slabby sandstone and siltstone, locally referred to as the "Rusty Beds." Thickness 100 to 150 feet (description and thickness modified from Hose, 1955 and

#### Morrison Formation (Upper Jurassic)—Pale-green, olive-green, blue-green to maroon and chalky white variegated calcareous and bentonitic claystones interbedded with lenticular light gray fine-grained friable crossbedded sandstones. Dinosaur bones and bone fragments are common in the upper portion of the section. Thickness 185 to 210 feet (description and thickness modified from Hose, 1955 and Ver Ploeg, 1998a)

# Sundance and Gypsum Spring formations undivided

#### Sundance Formation (Upper and Middle Jurassic)—Upper part; gray to greenish gray glauconitic shale with an upper layer consisting of slabby shale and calcareous sandstone that weathers brown and is slightly glauconitic. Lower portion is primarly slabby sandstone interbedded with shale. Locally, the lowermost 0-15 feet contains onlitic limestone. The Sundance formation is of marine origin and is characterized by a high content of glauconite and numerous belemnite fossil remains. Thickness 260 to 350 feet (description and thickness modified from Hose, 1955 and Ver Ploeg, 1998a)

#### Gypsum Spring Formation (Middle Jurassic)—Reddish brown shale, claystone, and siltstone interbedded with 1 to 3 foot thick limestone and limestone breccia. Limy gypsum beds in the lower part of the unit and light gray argillaceous limestone in the upper part of the section. Thickness ranges from 0 to 75 feet, the formation pinches out in the northwest central part of the mapped area, south of Pass Creek (description and thickness modified from Ver Ploeg and

# RPcg Chugwater and Goose Egg formations undivided

from Ver Ploeg, 1998)

Chugwater Formation (Upper and Lower Triassic)—Includes Crow Mountain Sandstone Member. Alcova Limestone Member and Red Peak Member, from top to bottom. Crow Mountain is reddish orange sandstone; Alcova is purplish gray limestone; Red Peak is red shale, siltstone and fine-grained sandstone. Thickness 700 to 900 feet (description and thickness modified

#### Goose Egg Formation (Triassic and Permian)—Dark red to reddish orange shale and siltstone with interbedded gypsum, limestone, and dolomite, mainly in the lower portion. Local thin conglomerate lenses made up of Paleozoic limestone, chert, and sandstone cobbles noted near the base of the formation on the upper portion of South River Slope in the south western part of the mapped area. This conglomerate may be equivalent to the Nowood Conglomerate

### thickness 300 to 350 feet (description and thickness from Ver Ploeg, 1998b) Tensleep and Amsden formations undivided

**Tensleep Sandstone (Pennsylvanian)**—White to buff, medium- to fine-grained, massive sandstone; interbedded with thin limestone and dolomite beds, especially toward the base. Upper and middle sandstones are usually characterized by large-scale crossbeds. Thickness ranges from 350 to 400 feet (description and thickness modified from Ver Ploeg, 1998b)

member of the Goose Egg Formation in the southeastern part of the Bighorn Basin. Formation

#### Amsden Formation (Pennsylvanian and Mississippian)—Includes from top to bottom, Ranchester Limestone Member – gray to purplish limestone and dolomite, interbedded with shale, siltstone, and sandstone; Horseshoe Shale Member - reddish brown to maroon shale and siltstone with thin beds of sandstone and carbonates; and Darwin Sandstone Member (Upper Mississippian) – gray to buff, fine- to medium-grained, crossbedded sandstone. Thickness

### about 250 to 400 feet (description and thickness modified from Ver Ploeg, 1998b) Madison Limestone (Upper and Lower Mississippian)—Alternating units of light tan to gray limestone and dolomite. Upper portion bluish gray limestone with karst surface at the top. Lower portion mainly dolomite and dolomitic limestone. The entire formation is fossiliferous; spiriferoid brachiopods and solitary tetracorals being the most common. Thickness ranges

## from 250 to 500 feet, thinning toward the south (description and thickness modified from Hose, 1955, and Ver Ploeg, 1998b) Ob Bighorn Dolomite (Upper Ordovician) and Harding Sandstone (Middle Ordovician) undivided— Gray massive cliff forming dolomite with a 5-foot thick light gray to yellowish brown

#### silicious sandstone at the base. Some zones of the dolomite and the lower sandstone of the Bighorn Dolomite are quite fossiliferous. A highly pitted weathered surface is characteristic of the dolomite member. The basal Harding Sandstone is light gray to red, fine- to mediumgrained, silicious sandstone approximately 30 feet thick. Locally, the basil unit contains primitive fish bones and plates. Total thickness 0 to 200 feet, pinching out in the southwest portion of the mapped area (description and thickness from Ver Ploeg and Greer, 1992) OCg Gallatin Limestone (Lower Ordovician and Upper Cambrian) and Gros Ventre Formation (Upper

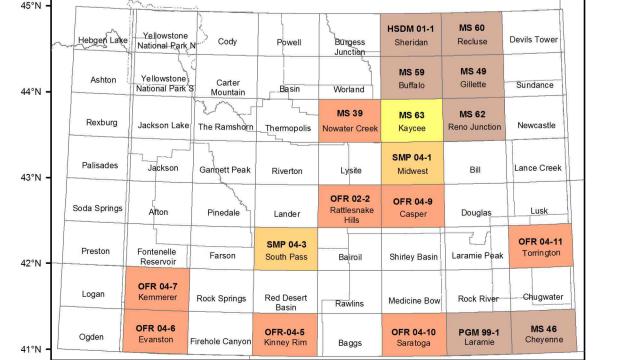
#### and Middle Cambrian) undivided—Uppermost unit (Gallatin Limestone) contains resistant grayish red limestone and thin beds of flat pebble conglomerate underlain by olive green to yellowish brown, glauconitic shale and siltstone. The middle unit (upper Gros Ventre Formation) includes light gray limestone, silty and glauconitic, interbedded with soft grayish green shale and a bed of flat pebble conglomerate. The basal unit (lower Gros Ventre from 10 to 30 feet (description and thickness from Ver Ploeg, 1998b) Formation) consists of yellowish brown to reddish brown, friable, medium- to coarse-grained glauconitic sandstone. The two formations are not distinguishable for mapping purposes in this area. Total thickness is 550 to 580 feet (description and thickness modified from Hose, 1955, and Ver Ploeg, 1998b)

#### Flathead Sandstone (Middle Cambrian)—Reddish gray, tan, and light brown medium to coarse-grained quartz sandstone in beds as much as 3 feet thick; locally conglomeratic and crossbedded. Thin interbeds of green, maroon, and tan siltstone, mainly in the upper portion; arkosic conglomerate in the lower part. Abundant inarticulate brachiopods and less numerous specimens of the trilobite *Elrathia sp.* are found within the top 2 to 3 feet of the formation. Thickness 300 to 400 feet (description and thickness modified from Hose, 1955, and Ver Ploeg and Greer, 1992)

#### Metasedimentary and metavolcanic rocks—Quartzite, hornblende gneiss, foliated marble, and allanite-bearing calc-silicate rocks. Occurs on the northeast portion of the Horn. Description modified from Hinrichs and others (1990).

### Granitic gneiss—Composed of quartz, plagioclase, biotite, and microcline. Intruded with quartz diorite and amphibolite dikes. Description modified from Hinrichs and others (1990) and

112°W 111°W 110°W 109°W 108°W 107°W 106°W 105°W 104°W

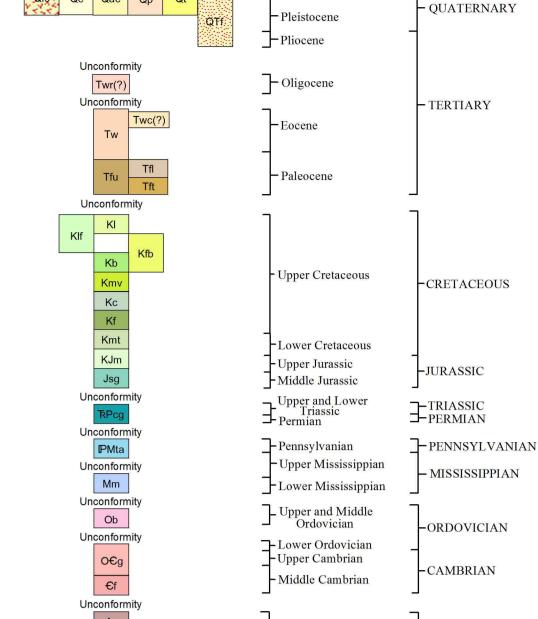


#### Published maps Current map Maps in progress Proposed maps INDEX TO 1:100,000-SCALE BEDROCK GEOLOGIC MAPS

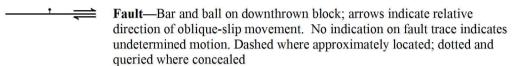
**OF WYOMING** 

**KEY TO ABBREVIATIONS** Wyoming State Geological Survey maps: Map Series (M), Open File Report (OFR), Preliminary Geologic Map (PGM), and unpublished STATEMAP project (SMP).





# MAP SYMBOLS



### Thrust fault—Sawteeth on upthrown block. Dashed where approximately located; dotted and queried where concealed source mapping or determined by field dip measurements and by

#### Monocline—Trace of axial plane compiled from source mapping or determined by field dip measurements and by photo interpretation. Arrows point in direction of dip

# DESCRIPTION OF MAP UNITS

#### Qa Alluvial deposits (Holocene)—Unconsolidated and poorly consolidated clay, silt, sand, and gravel, mainly in channel or meander belt of creeks and rivers. Includes lowest level terrace deposits in many of the stream valleys

### sand locally cemented by calcium carbonate. Consist of uncorrelated terraces which occur along present drainages, a few feet to several hundred feet above modern flood plains Older alluvial fan deposits (Pleistocene/Pliocene?)—Boulder gravels in a coarse matrix; subrounded and rounded pebbles, cobbles, and boulders of igneous, metamorphic, and resistant

### sedimentary rocks, interbedded with lenses of sand and silt. These deposits often occur on beveled bedrock surfaces 100 to several hundred feet above current drainages. Some isolated erosional remnants of these fan deposits occur as bench like features on the eastern flanks of the Bighorn Mountains and adjacent folds and the higher fan remnants may be Tertiary in age. The Mesa, a large alluvial fan feature trending southeast from the Horn, is included in this

#### Twr (?) White River Formation (?) (Oligocene)—A conglomeratic erosional remnant occurring on mountain upland surfaces toward the summit of the southern Big Horn Mountains on the west side of the map, described by Hose (1955) as probably Oligocene in age. These deposits appear to be Oligocene (?) fill in paleo-channels cut in Paleozoic and Precambrian rocks. Consists of Precambrian boulders, cobbles, and pebbles embedded in poorly stratified sandstone and bentonitic claystone. Thickness less than 50 feet (description and thickness modified from Hose, 1955 and Ver Ploeg and Greer, 1992)

#### Tw Wasatch Formation (Eocene and Paleocene?)—Lenticular interbeds of gray to light-brown, fine- to coarse-grained, locally conglomeratic, feldspathic to arkosic, crossbedded sandstone; dark- to light-gray or brown or greenish-gray shale, claystone, and siltstone. Subbituminous and lignitic coal beds and carbonaceous shales occur locally. Thicknesses of over 2400 feet (description based on Kohout, 1957)

#### Tfu Fort Union Formation undivided (Paleocene)—Yellowish-gray sandstone and siltstone; coals and carbonaceous shales; and, locally, thin lenses of conglomerate. The Lebo and Tullock Members of the Fort Union Formation cannot be differentiated in the northern third of the map. Here the lower 500 feet of the Fort Union Formation includes brown ferrugineous calcareous sandstone ledges interbedded with siltstone and shale. Maximum thickness about 3575 feet (Denson and others, 1995)

#### **Lebo Member**—In the southern two thirds of the mapped area the Fort Union Formation is divided into the Lebo Member and the Tullock Member. The Lebo Member is light to darkgray very fine grained to conglomeratic sandstone interbedded to varying degrees with gray siltstone, claystone, and carbonaceous shale and thin lenses of coal. Thicknesses range from 2325 to 3900 feet (description and thickness from Denson and others, 1995)

#### Tullock Member—Distinguished from the conformably overlying Lebo Member by its drab appearance and massive sandstone units. Interbedded tan to buff sandstone, siltstone, dark brown and gray carbonaceous shale, and thin coal beds. Thickness 1000 to 1725 feet (description and thicknesses from Denson and others, 1955)

# Upper Cretaceous rocks

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A digital version of this map will be available on CD-ROM.

#### Lance Formation—Light gray to light yellowish gray fine- to medium-grained lenticular sandstone interbedded with dark gray shales; some thin beds of brown carbonaceous shale occur in the upper half; bottom 100-200 feet includes light gray fine-grained thin bedded shaly sandstone with partings of dark gray shale. Thickness 1500 to 3325 feet (description and

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